00-RF-03081
JLB-036-00

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466

Ref: 8EPR-F

October 30, 2000

Mr. Joseph Legare
Department of Energy
Rocky Flats Field Office
P.O. Box 928
Golden, CO 80402-0928

Re: Major Modification to the Operable Unit 1 Corrective Action Decision/Record of Decision

Dear Mr. Legare:

EPA has reviewed and revised the above referenced document, and discussed various technical details regarding it with DOE's contractors. Through these discussions, the RFCA parties have come to agreement regarding the modification of the OU1 CAD/ROD and the future activities that will occur at OU1 to ensure that the remaining groundwater plume does not adversely impact surface water. This document clearly states our interpretation of the data that has been collected in this operable unit over the course of more than ten years of study and eight years of interim remedial action. Although there remains some uncertainty in the specific mechanisms at work, the conclusion that has been reached by all parties involved is that natural attenuation is the primary factor limiting the movement of this groundwater plume. We are also confident that natural attenuation will prevent this plume from reaching downgradient surface water in the future, and have described a monitoring program that we feel will give us the necessary information to track the changes that will occur in the plume over time and distance. In conjunction with the monitoring, the document prescribes contingent actions that will be implemented should the groundwater plume appear to threaten surface water through its movement.

As specified in this document, groundwater pumping from the Collection Well will continue for only one year beyond the date that this modification is signed by the RFCA parties. Because of this and the importance of natural attenuation in controlling the spread of contaminants at this location, EPA recommended that the modified remedy be listed in the document as "Limited

Groundwater Pumping and Monitored Natural Attenuation". DOE has objected to including the words natural attenuation as part of the official modified remedy, but does agree that natural attenuation is the primary mechanism limiting the spread of contaminants in groundwater at this location. Since the RFCA parties are in agreement regarding the present and future actions to take place at OU1, EPA approves the document, as revised on October 24, 2000.

If you have any comments or questions regarding these matters, please contact Gary Kleeman at 303 312-6246.

Sincerely,

Tim Rehder

Tim Rehder, Manager
Rocky Flats Project

cc: Steve Gunderson, CDPHE
Carl Spreng, CDPHE
Lane Butler, Kaiser-Hill
Dave Shelton, Kaiser Hill
Admin. Record, Bldg 850

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MAJOR MODIFICATION

TO THE

OPERABLE UNIT 1: 881 HILLSIDE AREA

CORRECTIVE ACTION DECISION/RECORD OF DECISION

Rocky Flats Environmental Technology Site
Golden, Colorado

November 2000

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Joseph Legare
U.S. Department of Energy, Rocky Flats Field Office

Date

Timothy Rehder
U.S. Environmental Protection Agency, Region VIII

Date

Steven Gunderson
Colorado Department of Public Health and Environment

Date

MAJOR MODIFICATION TO THE
OPERABLE UNIT 1
CORRECTIVE ACTION DECISION/RECORD OF DECISION

SITE NAME AND LOCATION:
Rocky Flats Environmental Technology Site, Operable Unit 1: 881 Hillside Area, Jefferson County, Colorado

LEAD AND SUPPORT AGENCIES:
Lead:
U.S. Environmental Protection Agency (EPA), Region VIII

Support:
U.S. Department of Energy, Rocky Flats Field Office (DOE-RFFO)
Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (CDPHE)

INTRODUCTION

The Corrective Action Decision/Record of Decision (CAD/ROD) Declaration for Operable Unit 1 (OU1), 881 Hillside Area, Rocky Flats Environmental Technology Site (RFETS) (DOE 1997) was signed on March 12, 1997 by representatives of the EPA, DOE-RFFO, and CDPHE. The CAD/ROD presented the selected remedy for addressing contamination in subsurface soil at Individual Hazardous Substance Site (IHSS) 119.1. Since the signing of the CAD/ROD, new sampling and analysis data were collected at IHSS 119.1. The results from this effort substantially support the need to significantly alter the selected remedy.

Paragraph 128 of the Rocky Flats Cleanup Agreement (RFCA) contains provisions for addressing and documenting major modifications to work being done pursuant to a CAD/ROD. Section 117(c) and (d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) contains provisions for addressing and documenting changes to a remedy that occur after a ROD is signed. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Section 300.435(c)(2)(ii) also addresses post-ROD information and public comment on post-ROD documentation. In accordance with these provisions and guidance provided in *A Guide to Preparing Superfund Proposed Plans, Records of Decisions, and other Remedy Selection Decision Documents* (EPA 1999), a modification to the CAD/ROD has been prepared for Operable Unit 1: 881 Hillside Area. This CAD/ROD Modification addresses and documents changes to the previous CAD/ROD declaration and presents the information gained since the time that declaration was signed along with the rationale leading to this modification.

REASONS FOR ISSUING CAD/ROD MODIFICATION

IHSS 119.1 Investigation

As described in the original CAD/ROD (DOE 1997), IHSS 119.1 is a former drum and scrap metal storage area. Aerial photographs indicate that these materials were primarily stored north of the Southeast Perimeter Road within IHSS 119.1. The scrap metal may have been coated with residual oils and/or hydraulic coolants (DOE 1994). The contaminants of concern (COCs) identified in the CAD/ROD at IHSS 119.1 are:

Carbon tetrachloride,
1,1-Dichloroethene,
Tetrachloroethene,
1,1,1-Trichloroethane,
Trichloroethene,
Selenium.

Residual contamination from past releases contaminated the groundwater and subsurface soils localized in the southwest portion of the IHSS and contributed to the degradation of groundwater quality in the immediate vicinity. The selected remedial action presented in the CAD/ROD included excavation and treatment of volatile organic compound (VOC)-contaminated soil by low temperature thermal desorption and extraction of groundwater entering the excavation for treatment in the existing Building 891 water treatment system. Excavated soil with VOC concentrations greater than the RFCA Action Level Framework (ALF) Tier I subsurface soil action levels for the organic COCs (Table 1) (DOE 1996) were to be treated onsite and returned to the excavation (DOE 1997).

In accordance with the CAD/ROD, additional sampling was performed downgradient of IHSS 119.1 to verify that a subsurface paleochannel did not contain VOCs at levels that could significantly impact surface water quality. Eleven geoprobe boreholes were located approximately 20 feet apart along the trend of the paleochannel between well 0487 and the southern boundary of IHSS 119.1 (see Figure 1). These borings were spaced so that the deepest portion of the paleochannel was investigated. Details of downgradient sampling activities can be found in the *Sampling and Analysis Plan for the Downgradient Investigation of IHSS 119.1* (RMRS 1997a). The results of this sampling, presented in the *Post-CAD/ROD Investigation Report for the 881 Hillside Area, IHSS 119.1* (RMRS 1997b), indicate that the subsurface paleochannel does not contain VOCs. The COCs were not detected in the downgradient samples at a detection limit of 0.62 parts per million (ppm) (Table 1).

In addition to the sampling performed downgradient of IHSS 119.1, eleven geoprobe boreholes were advanced within IHSS 119.1 to provide data for determining health and safety requirements during the excavation. Details of the sampling can be found in the *Sampling and Analysis Plan for the Implementation Sampling for the IHSS 119.1 Source Removal Project* (RMRS 1997c) and are summarized in Table 1. For Remedial Design/Remedial Action (RD/RA) purposes, these samples were collected in the areas tentatively identified in the CAD/ROD for excavation at IHSS 119.1.

The analytical results for the RD/RA implementation samples (RMRS 1997b) show that the actual soil concentrations of the COCs, if detected at all, are well below the ALF Tier I subsurface soil action levels (DOE 1996). Based on these results, it can be concluded that COC concentrations in soil within IHSS 119.1 are not above the ALF Tier I subsurface soil action levels (DOE 1996) as previously assumed. Thus excavation and treatment of these soils is not warranted.

Groundwater Evaluation

Trichloroethene concentrations within the OU1 plume are below detection limits 300 feet from the IHSS 119.1 source area indicating that natural attenuation processes are limiting the extent of the contaminant plume. Based on the hydraulic conductivity and gradient in the area, the groundwater flow rate in the IHSS 119.1 area has been estimated at around 70 feet per year (DOE 1995). In the 30 years since releases into the soil, the plume has not reached surface water. If natural processes were not limiting the contaminant plume, it should have a greater extent. These natural processes include "a variety of physical, chemical, and biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contaminants in soil or groundwater" (EPA 1997).

IHSS 119.1 is located on a south-facing hillside where locally saturated, unconsolidated surficial materials overlie weathered claystone bedrock. Groundwater in the area is limited and was estimated at 5-acre feet in April 1992 for the entire OU1 area. Groundwater in the IHSS 119.1 area occurs primarily in unconsolidated surficial materials and in disconnected northwest-southeast trending paleochannels cut into the bedrock. A paleochannel approximately 100 feet wide and five feet deep begins within IHSS 119.1 and channels groundwater flow towards the French Drain (see Figure 1). Recharge within the IHSS 119.1 area and downgradient paleochannel is minimal and occurs primarily through infiltration of precipitation. Groundwater discharge in the IHSS 119.1 area occurs primarily through evapotranspiration and through discharge into the French Drain (DOE 1995).

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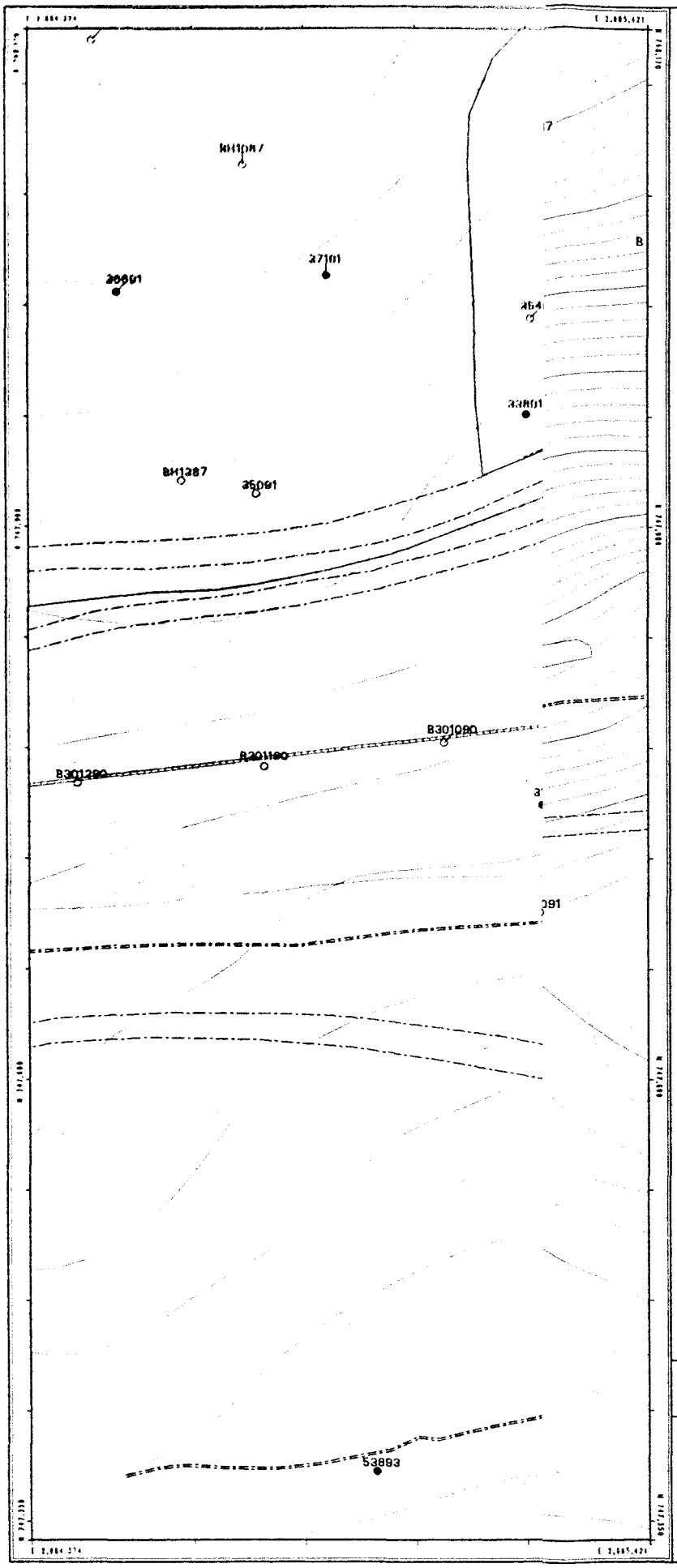


Figure 1

IHSS 119.1 Area

EXPLANATION

- Borehole Locations
- Groundwater Wells
- IMP Wells
- Geoprobe Locations
- French Drain System
- IHSS 119.1 Boundary
- Approximate location of OU1 Plume (concentration above 100 ug/l)

Standard Map Features

- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (2-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSI., Las Vegas. Digitized from the orthophotographs. 1/95

Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 2-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

Data Source:

Borehole and Groundwater Well data - Approved by Steve Singer (RMRS, 303-966-3387).

Individual Hazardous Substance Site (IHSS) data - Approved by Nick Demos (RMRS, 303-966-4605).

Scale = 1 : 1010
1 inch represents approximately 84 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: 2k-0402/ihss119_1_plume.aml

September 21, 2000

NT_Svr h:/projects/fy2k/2k-0402/ihss119_1_plume.aml

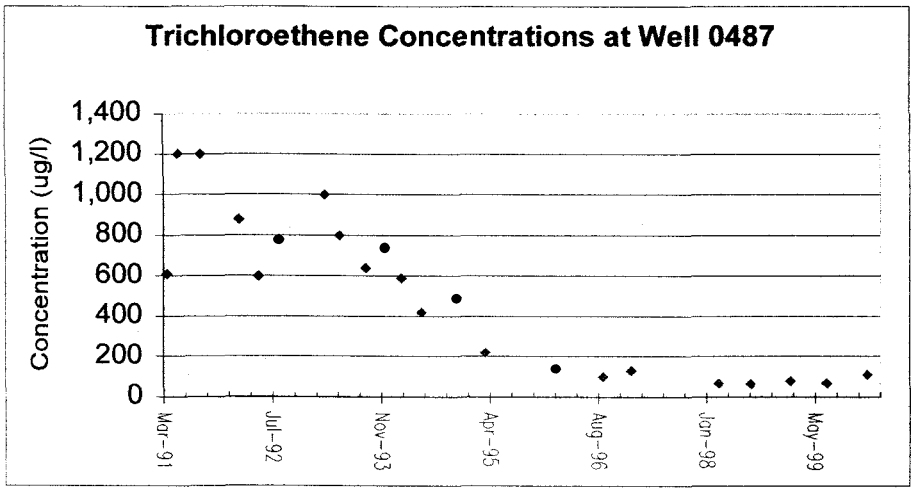
Releases of volatile organic compounds at IHSS 119.1 in the 1970s resulted in residual contamination in the subsurface soils and contributed to degradation of groundwater quality in the immediate vicinity. These releases were small and episodic, rather than large spills. Trichloroethene is the primary contaminant present in groundwater, with the highest concentrations found inside the IHSS boundary (DOE 1995). The Collection Well is located within the highest concentration area in the plume (Figure 1).

Natural attenuation processes include chemical transformation, biodegradation, dilution, dispersion, sorption, and volatilization. General conclusions regarding the evidence of natural attenuation can be made. While chemical transformation and biodegradation may be occurring in the OU1 plume, the expected contaminant degradation byproducts are not routinely detected indicating that these are either not important processes at this location, or that the byproducts are naturally attenuating at a faster rate than trichloroethene. Water levels in well 0487 rise in correlation with precipitation events which supports that the major source of recharge for the plume is precipitation (DOE 1995). This recharge results in dilution of the contaminants. Dispersion is not likely a major process because the plume is confined by the paleochannel. However, some dispersion of the contaminated groundwater into the relatively uncontaminated groundwater within the downgradient paleochannel probably occurred over time.

Sorption of organic compounds retards plume migration but cannot explain the significant reductions in concentration seen in this plume. Volatilization to the atmosphere is the most likely primary natural attenuation process in this area and was described as a migration path for VOCs in the OU1 Corrective Measures Study/Feasibility Study (DOE 1995). Volatilization is significant because of the shallow depth to groundwater, the volatile nature of the contaminants, the presence of unconsolidated materials and evapotranspiration discharge of the plume.

Concentrations are declining in both the Collection Well and 0487, located about 150 feet downgradient within the paleochannel (Figures 2 and 3). Trichloroethene concentrations in 1994 averaged 790 ug/l at the Collection Well and averaged 500ug/l at 0487. Currently trichloroethene concentrations are 370 ug/l at the Collection Well and 110 ug/l at 0487. The trend at 0487 indicates that natural attenuation processes were acting on this plume even before the Collection Well was installed in 1992 and pumped (Figure 2). Trichloroethene concentrations from the French Drain, approximately 150 feet downgradient of 0487, have remained consistently below detection limits. Only one sample has ever contained trichloroethene above the detection limits; a sample with 28 ug/l collected in 1995. This indicates that significant contamination is not reaching the French Drain.

Figure 2. Well 0487 Trichloroethene Concentrations.



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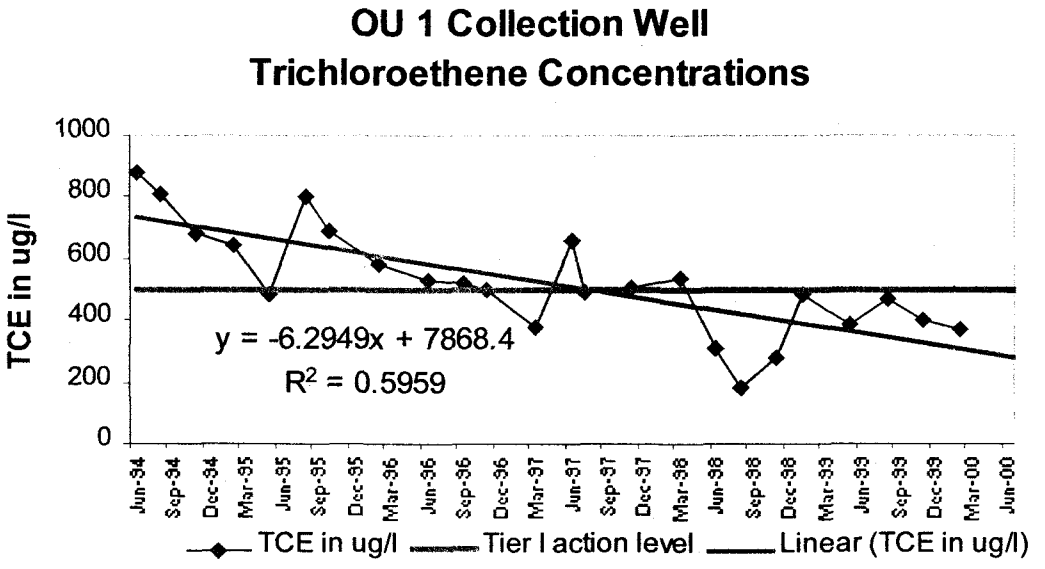
Seasonal and other variability is evident in Figure 3 but the overall attenuation rate at the Collection Well is approximately 60 ug/l per year. This well has been pumped since 1992 and removes about 13,000 to 17,000 gallons of water each year. It has not been determined how much attenuation is natural and how much is due to pumping. Trichloroethene concentrations at 0487 are much lower than at the Collection Well and are attenuating at a lower rate. After a fairly high attenuation rate from 1993 to 1995, the rate of attenuation at 0487 has declined and trichloroethene concentrations have remained at around 100 ug/l for the last 4 years. Concentrations are expected to decline slowly at this location. Trichloroethene concentrations in the 100 ug/l range have not resulted in contamination impacts at the French Drain, approximately 150 feet away.

Figure 3. OU 1 Collection Well Trichloroethene Concentrations and Projection.



Summary

There is no evidence that surface water quality was impacted from the OU1 plume. The declining concentrations at both the Collection Well and the downgradient well 0487 indicate that there will be no impact to surface water in the future. Natural attenuation is limiting the migration of this plume as supported by the following lines of evidence: 1) The plume has not migrated to the extent predicted based on groundwater velocity and contaminant retardation estimates, 2) Groundwater discharge by evapotranspiration and consequent contaminant volatization is significant, 3) Contaminant concentrations are declining.

Trichloroethene concentrations in the Collection Well have declined below 400 ug/l and further declines are anticipated with another year of ground water pumping. Some increase in concentration can be expected when pumping ceases. However, since the concentrations have declined below the ALF Tier I levels, it is cost effective to allow natural attenuation processes to continue to degrade the plume because surface water will not be impacted.

Based on the information presented above, a modification to the OU1 881 Hillside Area CAD/ROD (DOE 1997) is necessary to: a) present the information gained from the downgradient and implementation borehole sampling, and b) document the rationale for changing the remedy presented in the original CAD/ROD.

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DESCRIPTION OF ALTERNATIVES

Six candidate remedial alternatives were compiled and passed a detailed screening process conducted during the OU1 Corrective Measures Study/Feasibility Study (DOE 1995). These alternatives were summarized in the CAD/ROD (DOE 1997). From these alternatives, the original remedy, Soil Excavation with Groundwater Pumping, was selected. At the time the original remedy was selected, the subsurface soils at IHSS 119.1 were assumed to be contaminated, acting as a residual source to groundwater contamination. Based on the results of the RD/RA implementation sampling, the soil excavation component of the remedy should be eliminated. The modified remedy now reflects the apparent lack of a significant subsurface source of contamination at the IHSS and results in a modified alternative: Limited Groundwater Pumping and Monitoring. This alternative will be re-evaluated in this CAD/ROD Modification against the original remedy.

Original Remedy: Soil Excavation with Groundwater Pumping

The selected remedy was intended to achieve Remedial Action Objectives (RAOs) through excavation of contaminated subsurface soils and the extraction of contaminated groundwater beneath IHSS 119.1 as it entered the excavation. Based on the *Sampling and Analysis Report-Identification and Delineation of Contaminant Source Area for Excavation Design Purposes* (RMRS 1996), the estimated volume of contaminated soil that was planned for excavation from IHSS 119.1 was one thousand to two thousand cubic yards. The excavated subsurface soils would have been treated onsite with a thermal desorption unit and returned to the excavation.

Contaminated groundwater entering the excavation would have been extracted from the excavation and treated in the Building 891 treatment system. The existing French Drain and Building 891 treatment system was to continue to operate during the remedial activities until after remediation of the presumed source was complete. After source removal, the French Drain was to be decommissioned and groundwater collection and treatment would have ceased. Groundwater monitoring was to be performed consistent with the RFCA Integrated Monitoring Plan (IMP) after completion of the remedial action.

As part of the original CAD/ROD, decommissioning of the French Drain is separate from the Modified Remedy and was accomplished in September 2000. Water quality of groundwater collected by the French Drain has been sampled quarterly for laboratory analysis since 1993, in accordance with the IMP. The water quality data indicate that groundwater contaminant concentrations are consistently below ALF Tier II groundwater action levels.

The French Drain system was breached at the lowest point and the collected groundwater now flows underground through a conveyance to the South Interceptor Ditch. Now that decommissioning of the French Drain is completed, no long-term maintenance of the system will be required. The details of the decommissioning of the French Drain system are presented in a project work plan and in the OU1 881 Hillside Area Closeout Report.

Modified Remedy: Limited Groundwater Pumping and Monitoring

As discussed above, excavation will not occur. Contaminated groundwater has been extracted from the Collection Well and treated by the Building 891 treatment system since before the original CAD/ROD was signed. Water quality of the groundwater removed from the Collection Well has been assessed since June 1994. Because only trichloroethene has exceeded the ALF Tier I action level, the trichloroethene concentrations are considered a good indicator chemical for developing decision criteria. Due to the natural attenuation processes previously described in the Groundwater Evaluation section, trichloroethene concentrations are expected to continue to remain below the ALF Tier I action levels.

Operation of the Collection Well will continue for one year after the Major Modification to the CAD/ROD is signed by the EPA, CDPHE, and DOE-RFFO. At that time, if data from four quarters of monitoring shows that the average concentration for trichloroethene in the well continues to be below the ALF Tier I

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action level then pumping and treating of groundwater will be discontinued. The Collection Well will then be designated as a Plume Definition Well and initially monitored quarterly consistent with the IMP. If average trichloroethene concentrations in this Plume Definition Well (formerly the Collection Well) are observed for four consecutive sampling events above RFCA ALF Tier I action levels, impacts to surface water will be evaluated including calculation of an attenuation rate to determine if an action is necessary. The actions evaluated will include resumption of pumping and treating of the Collection Well.

Consistent with the original remedy, groundwater monitoring will be performed in accordance with the IMP after completion of groundwater pumping. The Collection Well and 0487 will continue to be monitored. These are currently in the IMP and will initially be monitored quarterly as Plume Definition Wells. Wells 4787, 4887, 10992, and 11092, which are currently listed in the IMP, will continue to be monitored semiannually as plume extent wells (Figure 1). Wells in the IMP Monitoring Program are evaluated annually. Once contaminant concentrations in the Plume Definition Wells have been below ALF Tier II levels for four consecutive sampling events, monitoring will be discontinued.

The IMP will contain the requirements for monitoring these wells through Site Closure with evaluation occurring during the 5-year CERCLA reviews. Long term stewardship monitoring beyond Site Closure will be established in the Final Site CAD/ROD. Table 2 presents the components of the original and modified remedy.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Threshold Criteria

Overall Protection of Human Health and the Environment: In the CAD/ROD, the original remedy was ranked the highest among the alternatives considered with respect to overall protection of human health and the environment because it was assumed to provide the largest reduction in exposure potential within the shortest amount of time through the removal of the contamination source (DOE 1997). Because the soil excavation component is the only factor differentiating the original remedy from the modified remedy (i.e., all other components of the original and modified remedy remain the same), the protectiveness of human health and the environment for the modified remedy is equal.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): ARARs identified in the original CAD/ROD are as follows:

- Classifications and Numeric Standards (5 CCR 1002-8, 3.8, So. Platte River Basin, now known as 5CCR 1002-38)
- Colorado Basic Standards for Surface Water (5 CCR 1002-8, 3.1, Segment 4a of Big Dry Creek, now known as 5 CCR 1002-31)
- Colorado Hazardous Waste Regulations (6 CCR 1007-3 Parts 264 and 268)
- Colorado Air Pollution Control Regulations (5 CCR 1001-5, Regulation 7)
- Colorado Nongame, Endangered or Threatened Species Conservation Act (CRS 33-2-1001)

In the CAD/ROD, the original remedy was expected to meet all of the ARARs identified. Because the soil excavation component is the only factor differentiating the original remedy from the modified remedy (i.e., all other components of the original and modified remedy remain the same), the ARARs identified will also be met by the modified remedy.

Primary Balancing Criteria

Long-term Effectiveness and Permanence: In the CAD/ROD, the original remedy was ranked highest among the alternatives considered with respect to long-term effectiveness and permanence since it removes both groundwater contamination and subsurface soil contamination sources in IHSS 119.1, thereby preventing any further contamination of groundwater (DOE 1997). It was determined through the CAD/ROD implementation sampling that significant subsurface soil contamination sources within IHSS 119.1 do not exist and, as a result, further contamination of groundwater is not anticipated. Because the soil excavation component is the only factor differentiating the original remedy from the modified remedy (i.e., all other components of the original and modified remedy remain the same), the long-term effectiveness and permanence for the modified remedy is equal.

Reduction of Toxicity, Mobility, or Volume Through Treatment: In the CAD/ROD, the original remedy was ranked highest among the alternatives considered with respect to reduction of mobility because it was assumed that the remedy would remove the primary source of contamination and treat contaminated groundwater. The original remedy was assumed to prevent any further migration of contamination to the groundwater (DOE 1997). Additionally, the original remedy was ranked highest with respect to the reduction of toxicity and volume through treatment because of the soil excavation and treatment. It was determined through the CAD/ROD implementation sampling that significant subsurface soil contamination sources in IHSS 119.1 do not exist and, as a result, further contamination of groundwater (i.e., contaminant mobility from the source) is not anticipated. Without the soil excavation component of the remedy, additional reduction of toxicity and volume will not be realized. Because the soil excavation component is the only factor differentiating the original remedy from the modified remedy (i.e., all other components of the original and modified remedy remain the same), achievement of a reduction of contaminant mobility, toxicity and volume through treatment for the modified remedy is equal.

Short-term Effectiveness: This criterion evaluates community, environmental and site worker protection during implementation of the remedy. It also evaluates the effectiveness and reliability of protective measures during implementation and the time until RAOs are achieved.

With respect to community, environmental, and site worker protection during implementation, the original remedy was ranked similarly to the other alternatives considered because, other than the no action and institutional control alternatives, all included some site disturbance (DOE 1997). Comparing the original remedy to the modified remedy, the potential for site disturbance is reduced because soil excavation will not occur. Decommissioning of the French Drain is the same for both the original and modified remedy. The short-term impact for the modified remedy is therefore considered lower than the original remedy.

With respect to the effectiveness and reliability of protective measures during implementation and for the time until RAOs are achieved, the original remedy was ranked the highest with respect to the other alternatives. This ranking was assigned because, as stated in the CAD/ROD, excavation was considered to be the most effective and reliable of the technologies considered (DOE 1997). Comparing the original remedy to the modified remedy, the need for protective measures during implementation is reduced because soil excavation will not occur. Decommissioning of the French Drain is the same for both the original and modified remedy. The rank of the modified remedy is therefore considered higher than the original remedy.

For the original remedy, compliance with RAOs was anticipated to be achieved in four to six months, the time necessary to complete the soil excavation. It was determined through the CAD/ROD implementation sampling that significant subsurface soil contamination sources within IHSS 119.1 do not exist and, as a result, further contamination of groundwater is not anticipated and the RAOs with respect to this portion of the remedy are achieved at present.

Implementability: This criterion evaluates the technical and administrative feasibility of implementing the alternative including the availability of materials and services needed during implementation, as well as the ability to monitor the effectiveness of the remedy.

In the CAD/ROD, the original remedy was ranked medium in comparison to the other alternatives considered with respect to implementability (DOE 1997). This ranking was applied because excavation was considered effective and the equipment necessary to excavate and treat the contaminated soil was readily available. Because the soil excavation component is the only factor differentiating the original remedy from the modified remedy (i.e., all other components of the original and modified remedy remain the same), the modified remedy is considered to rank higher (i.e., is easier to implement) than the original remedy because excavation and treatment will not occur.

Cost: This criterion evaluates the capital cost for each alternative, long-term operation and maintenance expenditures required to sustain it, and post-closure care costs occurring after the completion of remediation. Future expenditures are adjusted to present worth amounts by discounting all costs to a common base year using present worth cost analysis.

The cost of the original remedy presented in the CAD/ROD was $3.5 million. The cost of the modified remedy is reduced substantially because the soil excavation component and treatment costs are eliminated. The cost of the modified remedy is estimated to be $200,000.

NEPA Values

The environmental impacts of installation and operation of the French Drain and water treatment system were considered in the *Environmental Assessment and Findings of No Significant Impact for the 881 Hillside (High Priority Sites) Interim Remedial Action* (DOE 1990) (EA). As stated in the EA, the excavation of soils would increase the environmental impact of the action; as now proposed, not excavating the substantial amount of soil would lessen the impact of remediating OU1: 881 Hillside Area. Ceasing operation of the French Drain will have no increased short term or long term environmental impact because historical data indicate that contaminants of concern are below acceptable levels as indicated in the Interim Remedial Action. For the Collection Well, since the reason for the modification is the actual monitored decline of contaminants to levels below ALF Tier I action levels and a projected continued decline in contaminant levels, no environmental impacts are projected.

Modifying Criteria

State Acceptance: This criterion addresses the State's comments and concerns regarding the appropriateness of the selected remedy. The State of Colorado was represented during meetings that lead to the elimination of the soil excavation component of the original remedy and agreed with the modified remedy. At that time, the State had no outstanding, significant comments or concerns with the modified remedy.

Community Acceptance: This criterion evaluates the selected remedy (original or modified) in terms of issues and concerns raised by the public through the public involvement process. ALL COMMENTS RECEIVED ON THE MODIFIED REMEDY ARE ADDRESSED IN THE ATTACHED RESPONSIVENESS SUMMARY.

Anticipated Damages to Natural Resources: The modified remedy will not result in any irreversible damages to natural resources and the quality of groundwater will improve by treatment and natural degradation processes.

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THE MODIFIED REMEDY

The components of the modified remedy are detailed below:

1) The elements of the modified remedy for IHSS 119.1 selected to meet the RAOs include:

Downgradient investigation: DOE has performed confirmatory soil sampling downgradient of IHSS 119.1 to verify that a significant contamination source does not exist there. A detailed sampling and analysis plan was prepared.

Groundwater extraction and treatment: Groundwater will continue to be extracted from the Collection Well and transferred to the existing Building 891 treatment system for final treatment and discharge for a period of one year after signing the Major Modification to the CAD/ROD.

Groundwater monitoring: Groundwater monitoring will be performed at IHSS 119.1, consistent with the IMP, after the groundwater pumping is complete.

French Drain decommissioning: This work is separate from the Modified Remedy, but is included here for completeness. The French Drain system has been decommissioned and its use will be discontinued. The original OU1 CAD/ROD stated that final details of decommissioning of the French Drain would be presented in the Remedial Design for OU1. Since no further remedial action is required to meet the RAOs, a formal Remedial Design will not be prepared. Details of the decommissioning of the French Drain have been presented in a project Work Plan and will be included in the OU1 881 Hillside Area Closeout Report.

2) Institutional controls will be maintained throughout the OU1 area in a manner consistent with RFCA, Rocky Flats Vision, and the ALF. These documents recognize the reasonably foreseeable future land use for the OU1 area is restricted open space. The institutional controls will ensure that the restricted open space land use is maintained for the OU1 area and that domestic use of groundwater is prevented. The specific mechanisms to ensure the implementation and continuity of the necessary institutional controls have not been included in this CAD/ROD Modification. These mechanisms will be identified and implemented through the Final Site CAD/ROD.

3) Because of the groundwater and land use controls, the low amounts of contamination in OU1 outside of IHSS 119.1, and the low levels of risk associated with the contamination, no remedial action will be taken at the remaining IHSSs in OU1.

Implementing the modified remedy will not result in any irreversible damages to natural resources. Wetlands will not be injured; flood elevations will not be affected; and no permanent displacement or loss of wildlife will result from the implementation of the modified remedy.

STATUTORY DETERMINATIONS

The modified remedy for OU1 satisfies the statutory requirements of CERCLA Section 121. The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy satisfies the statutory preference for remedies that employ treatment that reduces, toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining in groundwater, a review will be conducted by DOE, subject to approval by EPA, within five years after the signing of this document by the RFCA parties to ensure that the remedy continues to provide adequate protection of human health and the environment.

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ADMINISTRATIVE RECORD

The documents listed in the reference section of this CAD/ROD Modification identify the documents that constitute the Administrative Record (AR) file for this CAD/ROD Modification per 40 CFR 300.825(a)(2). Upon completion of the public comment period, comments received from the public will be added to this AR file, along with the responsiveness summary and the Lead Regulatory Agency (LRA) approval letter. LRA approval of this CAD/ROD Modification constitutes approval of this AR file. The AR file is available at the following locations:

Rocky Flats Reading Room
Front Range Community College Library, Level B
3645 West 112th Avenue
Westminster, Colorado 80030

Office of Customer Service
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South, A1
Denver, Colorado 80222

Citizens Advisory Board
9035 Wadsworth Parkway, Suite 2250
Westminster, Colorado 80021

U.S. Environmental Protection Agency, Region VIII
Superfund Records Center
999 18th Street
Denver, Colorado 80202-2466

REFERENCES

DOE 1990, *Environmental Assessment and Findings of No Significant Impact for the 881 Hillside (High Priority Sites) Interim Remedial Action*, January 1990.

DOE 1994, *Final Phase III RCRA Facility Investigation/Remedial Investigation*, Rocky Flats Plant, 881 Hillside Area, Operable Unit 1, Department of Energy, Rocky Flats Plant, Golden, Colorado, June 1994.

DOE 1995, *OU-1, 881 Hillside Area, Corrective Measures Study/Feasibility Study,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, February 1995.

DOE 1996, *Final Rocky Flats Cleanup Agreement,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, July 16, 1996.

DOE 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, February 1997.

EPA 1997, *Use of Monitored Natural Attenuation At Superfund, RCRA Corrective Action, and Underground Storage Sites*, OSWER Directive 9200.4-17, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, Washington, D.C., November 1997.

EPA 1999, *A Guide to Preparing Superfund Proposed Plans, Records of Decisions, and other Remedy Selection Decision Documents.*

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IMP Working Group, 1999, *Rocky Flats Environmental Technology Site Integrated Monitoring Plan Background Document FY2000*, September 1999.

RMRS 1996, *Sampling and Analysis Report, Identification and Delineation of Contaminant Source Area For Excavation Design Purposes*, IHSS 119.1, Operable Unit 1, Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, April 1996.

RMRS 1997a, *Sampling and Analysis Plan for the Downgradient Investigation of IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, April 1997.

RMRS 1997b, *Post-CAD/ROD Investigation Report for the 881 Hillside Area, IHSS 119.1,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, April 1997.

RMRS 1997c, *Sampling and Analysis Plan for the Implementation Sampling for the IHSS 119.1 Source Removal Project,* Rocky Flats Environmental Technology Site, Golden, Colorado, RF/RMRS-97-009, April 1997.

Other Documents

City of Broomfield 2000, Letter from Kathy Schnoor to Norma Castaneda (DOE), regarding comments on the proposed Major Modification to the OU1 CAD/ROD, August 9, 2000.

DOE 1999, Letter from Joseph Legare (DOE) to Tim Rehder (EPA), recommending a path forward to closeout the OU1 CAD/ROD, Ref. 00-DOE-00704, December 14, 1999.

DOE 2000, Letter from Joseph Legare (DOE) to Tim Rehder (EPA), regarding submittal of Draft Proposed Major Modification to the OU1 CAD/ROD, Ref. 00-DOE-0143, February 8, 2000.

CDPHE 2000, Letter from Steven Gunderson, (CDPHE) to Tim Rehder (EPA), regarding Draft Proposed Modification to OU1 CAD/ROD, March 3, 2000.

EPA 1997, Letter from Tim Rehder (EPA) to Steve Slaten (DOE), regarding OU 1 Investigation and Record of Decision, Ref. 8EPR-F, July 7, 1997.

EPA 1999, Letter from Tim Rehder (EPA) to Joseph Legare (DOE), regarding OU 1 CAD/ROD Modification recommendations, Ref. 8EPR-F, December 29, 1999.

EPA 2000, Letter from Tim Rehder (EPA) to Joseph Legare (DOE), regarding Draft Proposed Modification to OU1 CAD/ROD, Ref. 8EPR-F, March 6, 2000.

EPA 2000, Letter from Tim Rehder (EPA) to Joseph Legare (DOE), regarding Major Modification to the Operable Unit 1 Corrective Action Decision/Record of Decision, Ref. 8EPR-F, October 30, 2000.

Man-In-The-Maze 2000, Letter from Greg Murray to Joseph Legare (DOE), Timothy Rehder (EPA), Steven Gunderson (CDPHE), regarding comments on the proposed Major Modification to the OU1 CAD/ROD, July 28, 2000.

City of Westminster 2000, Letter from Mary Harlow to Norma Castaneda (DOE), regarding comments on the proposed Major Modification to the OU1 CAD/ROD, August 18, 2000.

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Table 1. RFCA ALF Tier I Subsurface Soil Action Levels, Results of the Downgradient and IHSS 119.1 Investigation.

COC	ACTION LEVEL (MG/KG)	DOWNGRADIENT INVESTIGATION - FOD[1]	DOWNGRADIENT INVESTIGATION RESULTS (MG/KG)	IHSS 119.1 BOREHOLE SAMPLING - FOD[1]	IHSS 119.1 BOREHOLE SAMPLING RESULTS (MG/KG)
Carbon Tetrachloride	3.56	0/13	0.62 U	0/38	0.62 U
1,1-Dichloroethene	2.19	0/13	0.62 U	2/38	0.17J - 0.23J[2]
Tetrachloroethene	3.15	0/13	0.62 U	3/38	0.16J - 0.66[2]
1,1,1-Trichloroethane	94.8	0/13	0.62 U	2/38	0.16J - 0.28J[2]
Trichloroethene	3.28	0/13	0.62 U	2/38	0.34J - 0.55J[2]

[1]FOD = Frequency of Detection represents the number of detections/number of samples. Number of samples does not include duplicates.
[2] Range of detected values.
U = COC was not detected at the level indicated.
J = estimated concentration at the level indicated. The concentration represents a value below the detection limit.

Table 2. Primary components of the Original and Modified Remedies for OU 1.

Original Remedy	Modified Remedy
1) The principal components of the original remedy at IHSS 119.1 selected to meet the RAOs included: Excavation of soil: Excavation of contaminated subsurface soils was in two contamination sources areas identified during a 1996 soil gas survey. The location of these two areas was identified in the CAD/ROD. From the soil gas survey results, it was estimated that the amount of soil that to be excavated was one thousand to two thousand cubic yards. During the excavation, sampling was to be performed to confirm the point at which all contaminated subsurface soil had been removed, in accordance with the ALF. A detailed soil excavation plan and sampling and analysis plan would be prepared as part of the RD. Downgradient investigation: DOE would perform confirmatory soil sampling downgradient of IHSS 119.1 to verify that a contamination source does not exist there. A detailed sampling and analysis plan would be prepared as part of the RD. Groundwater extraction and treatment: Groundwater was to be extracted from the excavation and transferred to the existing Building 891 treatment system for final treatment and discharge. French Drain Decommissioning: After all contaminated subsurface soil was excavated and all contaminated groundwater was extracted from the excavation, the French Drain system was to be decommissioned and its use discontinued. The final details of the groundwater extraction and decommissioning of the French Drain system were to be presented in the RD for OU 1. Handling and management of excavated soil: DOE considered three options for managing the excavated soil. The option agreed upon was onsite treatment and placement back into the original excavation. The details of how the excavated soil was to be handled and managed would have been prepared as part of the RD. Groundwater monitoring: Groundwater monitoring was to be performed at IHSS 119.1, consistent with the Integrated Water Management Plan, after the remedial action was complete. The details of this groundwater monitoring were to be presented in the RD.	1) The principal components of the modified remedy for IHSS 119.1 selected to meet the RAOs include Downgradient investigation: DOE has performed confirmatory soil sampling downgradient of IHSS 119.1 to verify that a significant contamination source does not exist there. A detailed sampling and analysis plan was prepared. Groundwater extraction and treatment: Groundwater will continue to be extracted from the Collection Well and transferred to the existing Building 891 treatment system for final treatment and discharge for a period of one year to verify that the declining trend will continue. Groundwater monitoring: Groundwater monitoring will be performed at IHSS 119.1, consistent with the RFETS Integrated Monitoring Plan, after the groundwater pumping is complete.
2) Institutional controls will be maintained throughout the OU 1 area in a manner consistent with RFCA, Rocky Flats Vision, and the ALF. These documents recognize the reasonably foreseeable future land use for the OU 1 area is restricted open space. The institutional controls will ensure that the restricted open space land use is maintained for the OU 1 area and that domestic use of groundwater is prevented. If the reasonably foreseeable future land use for OU 1 area changes when final sitewide land use decisions are made, this remedy will be reexamined to ensure protectiveness of human health and the environment. The specific mechanisms (for example, deed restrictions) to ensure the implementation and continuity of the necessary institutional controls have not been included in this CAD/ROD. Currently, these mechanisms are envisioned to be placed in the Final Sitewide CAD/ROD or in this CAD/ROD during one of the five-year reviews of this document. However, should the Final CAD/ROD not occur or not include these institutional control mechanisms, this OU 1 CAD/ROD will be revised to include them, if it does not already include them as a result of a five-year review. The institutional controls can also be removed at one of the above times, if it is deemed appropriate to do so by the parties.	2) Institutional controls will be maintained throughout the OU 1 area in a manner consistent with RFCA, Rocky Flats Vision, and the ALF. These documents recognize the reasonably foreseeable future land use for the OU 1 area is restricted open space. The institutional controls will ensure that the restricted open space land use is maintained for the OU 1 area and that domestic use of groundwater is prevented. The specific mechanisms to ensure the implementation and continuity of the necessary institutional controls will be identified and implemented through the Final Site CAD/ROD.
3) Because of the groundwater and land use controls, the low amounts of contamination in OU 1 outside of IHSS 119.1, and the low levels of risk associated with the contamination, no remedial action will be taken at the remaining IHSSs in OU 1.	3) Because of the groundwater and land use controls, the low amounts of contamination in OU 1 outside of IHSS 119.1, and the low levels of risk associated with the contamination, no remedial action will be taken at the remaining IHSSs in OU 1.

RESPONSIVENESS SUMMARY

OVERVIEW

The Major Modification to the Operable Unit 1 Corrective Action Decision/Record of Decision was available for public review and comment from July 24, 2000 through August 21, 2000. This Responsiveness Summary provides a summary of the comments received during the public comment period, as well as, the DOE responses to the public comments.

SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND DOE RESPONSES

1. The following are comments, and corresponding responses, received from the City of Broomfield.

Comment: The declining trend identified in Figure 1 is not reflective of statistical means, nor does the figure correlate concentrations to dry seasons or wet seasons. Figure 1 reflects a linear regression, not a statistical regression; therefore, Tier I levels may be exceeded in the future. Broomfield agrees with the EPA's recommendations to continue collection of the groundwater to reduce the concentration of TCE to a level approximating the Tier II groundwater value. The City of Broomfield recommends collection and treatment of groundwater to continue until Tier II values are achieved for a continuous two-year period to ensure concentrations of TCE are stable and below Tier I levels during wet seasons. Continuing the treatment and removal of TCE ensures there will be protection of surface water standards. DOE assumed natural attenuation will occur, therefore reducing the impact to surface water. DOE also assumes the linear regression model accurately represents the system, but seasonal precipitation is a variable that is not factored into the linear regression model. What modeling was used to confirm surface water would not be impacted at levels two orders of magnitude or less? Broomfield would appreciate the opportunity to review the modeling performed.

Response: We appreciate Broomfield's visit to the Site on August 11th. The following responses summarize the data provided and also provide additional clarification. Water quality and volume data for the Collection Well and French Drain were provided to Broomfield on August 15th.

There are declining concentrations at both the Collection Well and the downgradient well. As noted, there are seasonal variations in the TCE concentrations at the Collection Well. However, even with these variations, contaminant concentrations are consistently below Tier II action levels in the French Drain. This evaluation, now included in the modification, shows that there is no impact to surface water.

No additional modeling was performed, however, a discussion of the natural attenuation processes causing the declines in contaminant levels and limiting the extent of the OU1 Plume are now included, along with a map showing the locations of the pertinent features. This discussion includes data from the downgradient well and French Drain that show surface water quality was not and will not be impacted by the OU1 plume. Surface water is demonstrated to be protected at the current contaminant concentrations in the Collection Well. However, pumping the Collection Well will continue for one more year. The Collection Well will remain in place and be monitored through Site Closure. Evaluation and/or actions will be triggered if the downward trend of TCE is not sustained and concentrations consistently are above Tier I action levels.

Comment: Broomfield is concerned with the action to remove the French Drain when there is a high potential to impact surface water if levels of TCE remain that are just below Tier I levels. Both EPA and CDPHE acknowledge that removing the French Drain eliminates a "line of defense" for surface water, and they emphasize the need to include an evaluation of impact to surface water. Has the evaluation been performed? Broomfield would appreciate the opportunity to review the evaluation of impact to surface water and the details of decommissioning of the French Drain system. If the first line of defense for surface water is removed, does DOE realize the potential costs that could be incurred to perform corrective actions to protect surface water? Broomfield is adamant the French Drain should not be removed until DOE is confident there will be no impact to surface water.

Response: TCE concentrations are declining over time by natural attenuation at both the Collection Well and the downgradient well now included in the CAD/ROD Modification. Neither current nor historical TCE concentrations caused an impact to the water collecting in the French Drain. Decommissioning the French Drain therefore will not increase the risk to surface water. An evaluation of the potential for impacts to surface water has been added to the CAD/ROD Modification along with the natural attenuation processes that are causing the decline in TCE concentrations.

Data from the French Drain show that contaminant concentrations are consistently below Tier II action levels and the water quality is not impacted by upgradient contamination. Therefore, the French Drain is not required as a line of defense to protect surface water. The Collection Well will remain in place, and if required, could be immediately returned to service.

Comment: DOE stated on page 7 of the OU1 CAD/ROD Modification, "the selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. DOE has not proven the modified remedy protects the environment (surface water) with the information provided in Figure 1. The remedy has not been satisfied because treatment of hazardous substances has not been completed to reduce the toxicity, mobility, or volumes as a principal element. The minimal costs of $40,000 a year to treat the groundwater until consistent concentration levels of TCE are below Tier I does not impact funds for other more beneficial projects which have already been funded. DOE should consider the potential costs if they have to remediate the IHSS after the French Drain is removed and hazardous substances are contaminating the surface water. The constituents of concern (COC) in subsurface soils are well below the Tier I action levels according to Table 1 of the CAD/ROD. Has an evaluation been performed to determine the impact to surface water from the COCs remaining within the subsurface soil? Will groundwater within this area have the potential to daylight to the surface? If the groundwater does daylight, will it meet surface water standards, or is DOE counting on dilution in the South Interceptor Ditch and Pond C-2? DOE should remove or destroy hazardous substances to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long term management. According to CERCLA, DOE's goal should be long term effectiveness and permanence to successfully remediate OU1, and not, as indicated in the modification, to anticipate the need for additional remedial actions in the future in the event that Tier I concentrations are exceeded.

Response: A source removal was planned as stated in the original OU1 CAD/ROD to address contamination in the subsurface soils. However, investigation results indicated that a source above RFCA Tier I levels is not present and a source removal is not warranted. The contaminant-specific RFCA Tier I action levels were calculated as the concentrations within subsurface soils capable of leaching contaminants to groundwater at concentrations greater than or equal to 100 x MCLs. Tier II action levels were calculated to identify soils that may need to be remediated or managed to protect surface water quality via groundwater transport. All soil contaminant concentrations were below Tier I and Tier II levels and are protective of surface water.

As above, an evaluation was performed to determine that there is no potential to impact surface water. This evaluation is now included in the CAD/ROD Modification. Groundwater in this area is collected by the existing French Drain and does not daylight as seeps. The water in the French Drain does meet surface water standards.

This CAD/ROD Modification meets DOE's goals of long-term effectiveness and permanence. Text in the Modification has been clarified to address this issue.

Comment: The City of Broomfield at this point in time does not believe DOE has effectively analyzed analytical trends that guarantee concentrations of TCE will remain below Tier I levels. The modification does not explain how the reduction of the remedy eliminates, reduces, or controls exposures to environmental receptors, which would degrade surface water quality. Broomfield wants to reiterate the need to continue pumping and treating the contaminated water until assurances are in place to guarantee the final remedy has been completed.

Response: As stated above, the CAD/ROD Modification now includes text showing that surface water is adequately protected. However, the Collection Well will remain in place, and will continue to be pumped for one year. The Collection Well will then be monitored through Site Closure, and potentially longer if required for long term Stewardship monitoring. If contaminant concentrations rise above the Tier I action levels, evaluation of the impact to surface water will be performed, followed by an action, if required. This action may involve resumption of pumping and treating of the groundwater. If deemed necessary, pumping at this location can immediately resume.

2. **The following are comments, and corresponding responses, received from City of Westminster.**

Comment: A correlation of Trichloroethene (TCE) concentrations to the water table levels reflected in the OU1 collection well needs to be completed. Such a graph would give a more complete picture of the TCE values relative to the water table. There is a possibility that the natural ebb and flow of the underlying water table could directly impact the TCE concentrations. Breaching the French Drain before the water balance study is complete would be premature. Removing the Drain eliminates a line of defense for surface water and emphasizes the need to include an evaluation of impacts to surface water.

Response: We appreciate Westminster's visit to the Site on August 11th. The following responses summarize the data provided and also provide additional clarification. As requested, water quality and volume data for the Collection Well and French Drain were provided on August 15th.

Water levels for the Collection Well do not reflect existing site conditions because the well is pumped regularly, and the water level in the well does not recover between pumping events. However, correlation of water volumes pumped versus TCE concentrations shows that higher water volumes (higher water levels) correlate to higher TCE levels. Although higher water levels appear to mobilize some residual TCE above the water table, there is still no impact to surface water from these higher concentrations.

Data from the downgradient well located between the Collection Well and the French Drain, also show a strong downward trend. These data are now included in the CAD/ROD Modification. Data from the French Drain show that, even with variations in TCE concentrations in the Collection Well, contaminant concentrations are consistently below Tier II action levels in the French Drain and the water quality is not impacted by the upgradient contamination. Therefore, the French Drain is not required as a line of defense to protect surface water. The Collection Well will remain in place, and if required, could be immediately returned to service. Additional information documenting the lack of impact to surface water was added to the OU1 CAD/ROD Modification.

Comment: The simple linear regression of TCE concentrations over time as noted in Figure 1 (OU1 Collection Well Trichloroethene Concentrations Projections) shows the r-squared value of 0.5959. A value that was closer to 1 would provide greater confidence that a declining trend was indeed occurring. Rather than relying on an assumption that natural attenuation is taking place, and that the linear regression model accurately reflects the system, DOE is strongly encouraged to maintain the system for three more years in order to obtain better statistical data to prove that the trend is actually occurring.

Response: The simple regression was based on data available since the Collection Well was installed in 1992 and indicates a general declining trend but also shows seasonal and weather-related variability. A regression based on the average annual concentrations resulted in an r-squared value of 0.82 corroborating the declining trend. In addition, when data from the Collection Well were segregated by quarter, to eliminate seasonality, each quarter's results also show strong declining trends.

However, rather than relying only on the linear regression model, additional data have been provided in the document that discusses the natural attenuation processes that are taking place and causing the decline in concentrations. Data are also now included from the downgradient well, which exhibits a strong decline in concentrations further supporting natural attenuation. Low groundwater flow rates (calculated at 70 feet per year) combined with the natural attenuation processes known to be occurring preclude the potential for impacts to surface water from higher concentrations.

In addition, the Collection Well will remain in place, and will continue to be pumped for one year. The Collection Well will then be monitored through Site Closure, and potentially longer if required for long term Stewardship monitoring. If contaminant concentrations rise above the Tier I action levels, evaluation of the impact to surface water will be performed, followed by an action, if required. This action may involve resumption of pumping and treating of the groundwater. If deemed necessary, pumping at this location could immediately resume.

Comment: Attached graph #1, prepared by City Staff using DOE data, shows the relationship between Trichloroethene concentrations and precipitation at Rocky Flats. It appears that there are higher concentrations during periods of low precipitation. Although the February 00 concentration data point goes down below 400 ug/l after the October 99 precipitation event of 3.5 inches of rain, there is not enough additional information to indicate that there is indeed a downward trend of TCE in the OU1 Collection Point.

Response: We have correlated volumes pumped from the Collection Well with TCE concentrations. As indicated in the response to the first comment, these data indicate that there is a positive correlation between volume pumped and TCE concentrations and suggests that higher water levels mobilize residual TCE. However, even at the higher concentrations, there is no impact to surface water.

Infiltration rates decrease during high rainfall events because the area has steep slopes that promote runoff instead of ponding and infiltration when rainfall exceeds infiltration capacity. For this reason, the February value is probably a result of declining concentrations, and not dilution.

Pumping the Collection Well will continue for one more year after the CAD/ROD Modification is signed. Then the Collection Well will remain in place and be monitored through Site Closure. Evaluation and/or actions will be triggered if the downward trend of TCE is not sustained and concentrations consistently are above Tier I action levels.

Comment: Attached graph #2 provides a correlation of precipitation vs. Trichloroethene data points. Most of the data points are concentrated in the area of 0.5 to 1 inches of precipitation, which is the usual annual amount of precipitation for this area. It would seem that data from a normal precipitation year would provide a much stronger indicator that there was indeed a downward trend.

Response: There is limited infiltration of precipitation in this area. As above, higher rainfall amounts tend to run off instead of infiltrating into the ground. Because there is limited infiltration, and therefore limited dilution during large precipitation events, the existing data are useable to indicate a declining trend.

Comment: The proposed 1-year operation of the collection well is too short a period of time to monitor the concentration levels and trends. There is a potential for alteration of the underlying groundwater levels, as well as changes of flows occurring during removal of contaminated building foundations located below the groundwater table.

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Response: The Collection Well has operated since installation in 1992 and the resulting data show a consistent downward trend. Continued operation for one additional year will confirm that the trend is continuing below Tier I action levels. The Site expects that operation of the Collection Well has altered groundwater levels as you suggest. Some rebound of concentrations is anticipated when pumping is stopped. Therefore, as stated above and as described in the CAD/ROD Modification, an evaluation and potential actions will be triggered if concentrations rise above Tier I action levels.

There are no building foundations in the groundwater flow path to or from IHSS 119.1, so Site Closure will not impact flow paths in this area. However, continued monitoring of the Collection Well and downgradient well will determine if unforeseen changes in site conditions do occur and allow the Site to react appropriately.

Comment: The City would also request that monitoring for TCE and other contaminants from the 881 Hillside is initiated at Indiana if DOE is determined to proceed with this proposed modification. Protection of the Woman Creek Reservoir from TCE and other Hillside contaminants must be ensured.

Response: At the higher concentrations historically seen at the Collection Well and downgradient well, there were no impacts seen in the French Drain water and therefore, no possible impacts to surface water. With the declining concentrations that are a result of natural attenuation, surface water will continue to be protected. Monitoring will continue at the Collection Well and downgradient well to verify the declining trends. Because surface water will not be impacted, Woman Creek Reservoir will be protected and additional monitoring at Indiana is not necessary.

Comment: Long-term stewardship costs, as well as institutional controls related to the Major Modification are not included in the document. Please provide this information to the City, and add it to the final decision document.

Response: Long-term stewardship costs are not yet available and will be developed as part of the Final Site CAD/ROD. The institutional controls text previously in the CAD/ROD Modification has been modified to add: "The specific mechanisms to ensure the implementation and continuity of the necessary institutional controls have not been included in this CAD/ROD Modification. These mechanisms will be identified and implemented through the Final Site CAD/ROD."

3. **The following are comments, and corresponding responses, received from Man-In-The-Maze Consulting.**

Comment: The assumption is questioned that "Based on the OU1 CMS/FS modeling results and the conclusions presented in the Final Post CAD/ROD Investigation Report, the source of contamination at IHSS 119.1 has been removed."

Response: The original CAD/ROD for OU 1 presented excavation and treatment of contaminated soils as the selected remedy for addressing contamination in subsurface soils at IHSS 119.1. The CAD/ROD also required subsurface sampling downgradient of IHSS 119.1 to verify that a downgradient contaminant source did not exist. In addition, soil samples were collected in the source areas identified in the CAD/ROD to determine the health and safety requirements and radiological controls for the excavation. Three geoprobe borings were located within the highest concentration area for each of the two source areas previously delineated. Four additional geoprobe borings were placed at locations biased towards finding detectable contamination. As documented in the Final Post CAD/ROD Investigation Report (RMRS, 1997), analytical results for all samples were below RFCA Tier 2 action levels, and all but one result were below detection limits. For this reason, it was concluded that there was not a contaminant source present that would warrant excavation. EPA concurred with this decision per letter 8EPR-F dated July 7, 1997.

Comment: Is there less groundwater available to transport the contaminants during dry periods?

Response: Yes. This is an arid climate, and the groundwater volume is limited. As discussed in the OU1 CMS/FS, groundwater recharge in this area is a result of precipitation as well as groundwater flow from the bedrock. Therefore, less groundwater is available during dry periods.

Comment: Is groundwater less effective in transporting contaminants when either the surface or subsurface water is frozen?

Response: Groundwater flow occurs primarily in the shallow, unconsolidated material (colluvium) which overlies the claystone bedrock. While the groundwater is shallow, the depth to groundwater is generally below the frost line. Therefore, freezing temperatures have little impact on groundwater flow and temperature fluctuations in the groundwater are limited. Frozen surface water in the area may limit recharge to the groundwater in the area until it melts. However, this area is on a south-facing slope with limited snow and ice accumulation. In general, groundwater flow rates, and therefore contaminant transport rates, are low in this area primarily because of the clayey nature of the colluvium and bedrock.

Comment: Can some contamination that is situated above a low water table resist transport during dry periods?

Response: Yes, however the investigation referenced above found little evidence for contamination above the water table. The only contaminants detected above the detection limit were found at a depth of approximately 16 feet below ground. A few contaminants are present below the detection limit at shallower depths. The low-level of contaminants present in a few geoprobe boreholes are dense non-aqueous phase liquids (DNAPL) which, by their nature, tend to seek a level below the water table. If droplets of DNAPL occur above the water table, these would tend to be mobilized only when the water level rose to their elevation.

Comment: Is there a positive correlation between the effect of precipitation and temperature on the contamination transport system and the well readings?

Response: Concentrations of trichloroethene, the major contaminant present in the Collection Well, were correlated to the Collection Well volume. There is a positive correlation between increased groundwater volumes and increased contaminant concentrations, which probably indicates that the residual volatile organics are still being flushed. However, contaminant concentrations are still well below the RFCA action levels and there is a long-term downward trend in contaminant concentrations.

Depending on the depth, shallow groundwater temperatures at the Site fluctuate a minor amount. When groundwater is more than 10 feet below ground surface, temperature fluctuations are minimal. For this reason, correlation of concentrations to temperatures is not planned.

Comment: The downward trend of data in the OU 1 Collection Well chart could reflect the decreasing availability or effectiveness of the contamination transport medium and that the source of contamination at IHSS 119.1 has been removed. If the scenario that I have presented is correct, the contamination is still present and just lacking sufficient groundwater to transport it down gradient.

Response: As stated above, an investigation was completed to locate a contaminant source in or near IHSS 119.1. The investigation results led to the conclusion that a source was not present which could be remediated. Groundwater results support this conclusion. Based on this evidence, a source is not present in the IHSS 119.1 area.

This is an area of complex hydrogeology. Extensive investigations have taken place for this area beginning in 1986 in order to better understand the contaminant nature and extent. As a result of the information obtained and in conjunction with the declining trend in contaminant concentrations observed from the Collection Well, this CAD/ROD modification was prepared.

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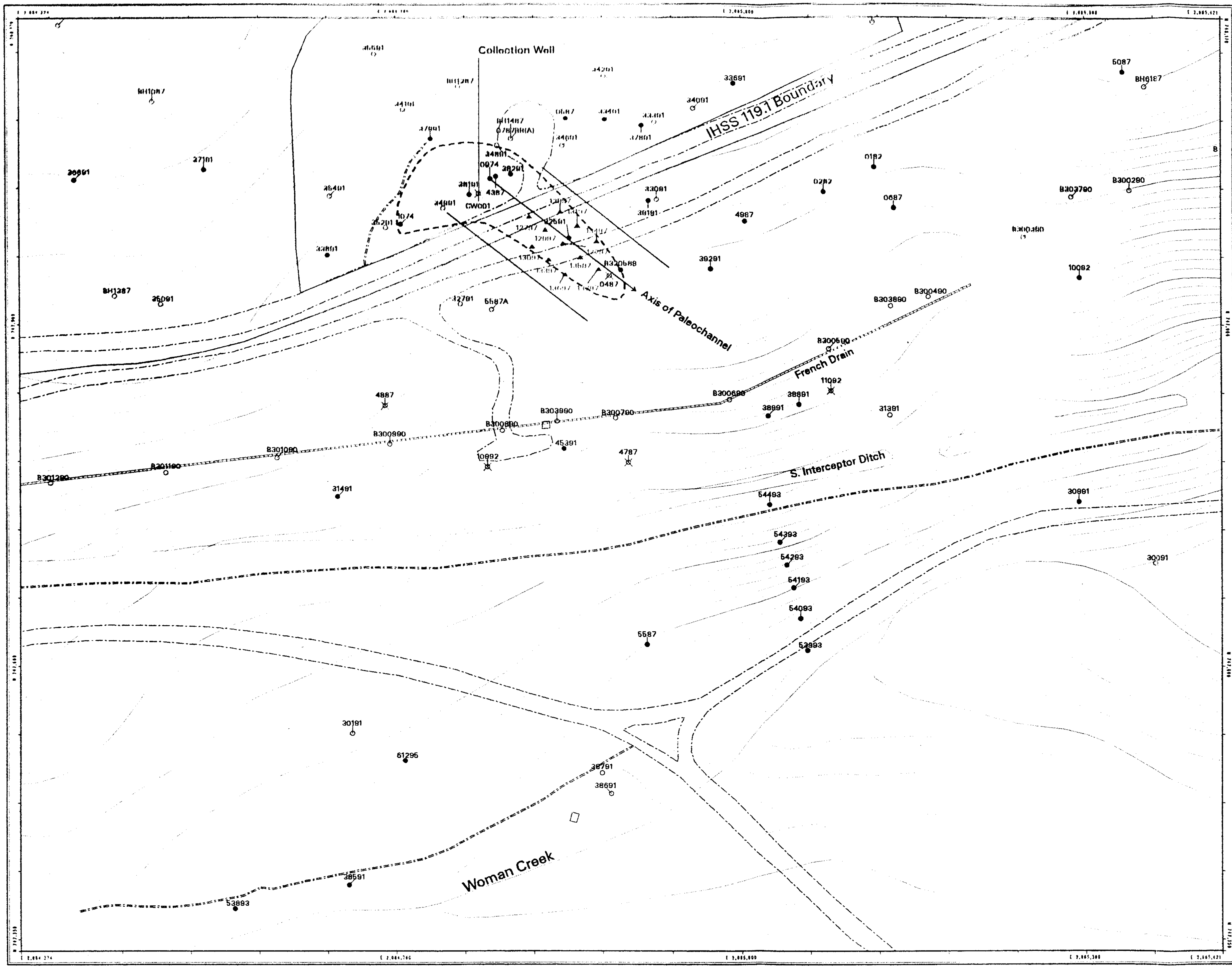

Figure 1
IHSS 119.1 Area

EXPLANATION

- Borehole Locations
- Groundwater Wells
- IMP Wells
- Geoprobe Locations
- French Drain System
- IHSS 119.1 Boundary
- Approximate location of OU1 Plume (concentration above 100 ug/l)

Standard Map Features

- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (2-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 2-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.
Data Source:
Borehole and Groundwater Well data - Approved by Steve Singer (RMRS, 303-966-3387).
Individual Hazardous Substance Site (IHSS) data - Approved by Nick Demos (RMRS, 303-966-4605).

Scale = 1 : 1010
1 inch represents approximately 84 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: **DynCorp** THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: 2k-0402/ihss119_1_plume.aml

September 21, 2000

NT_Svr h:/projects/fy2k/2k-0402/ihss119_1_plume.aml